science news

Nov. 10, 1973
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Science in Wonderland

# ESP

# Conversation Pieces

***Technically intriguing items from TRW, guaranteed to add luster to your conversation and amaze your friends.***

***How Many Days in a Year?*** A year is the time it takes for a planet to make one complete revolution around the Sun. Our own planet earth, for example, completes its orbit every 365.24199 days, a time which doesn't divide nicely into 52 seven-day weeks. Responding to this knotty situation, Julius Caesar devised a calendar in which he picked up an extra quarter day by having 365 days in the first three years and 366 in the fourth (leap year). While an improvement on the existing system, the Julian calendar was just over eleven minutes longer than the true solar year, so that every 128 years it gained a full day on the Sun.

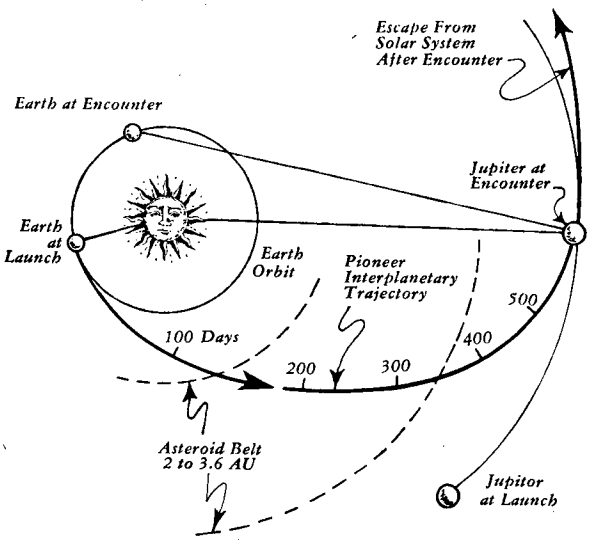
Pope Gregory narrowed the discrepancy by ruling that years ending in 00 were not to be leap years unless they were divisible by 400. This saved three days every 400 years and put the Gregorian calendar (which we presently use) within 25 seconds of the true solar year.

The year on the planet Jupiter is informatively different. Its great distance from the Sun (half a billion miles compared with the earth's 93,000,000) means that it takes Jupiter 11.86 earth years to complete one of its vast orbits. Unlike the earth (which rotates on its axis once every 24 hours), giant Jupiter rotates once every 9 hours and 51 minutes. Thus its day is less than half as long as ours. The combination of short days and long years on Jupiter means that there are more than 10,500 days in the Jovian year. Like everything else about Jupiter, its calendar is big and bulky. In fact, its immense size has caused one astronomer to remark that the solar system is made up of "the Sun, Jupiter, and some debris."

On December 3 of this year, a historic event involving the earth and Jupiter will take place. The Pioneer 10 spacecraft, built by TRW for the NASA-Ames Research Center, will fly past Jupiter. For 21 months, Pioneer has been streaking toward its target at speeds ranging from 30,000 to 80,000 miles per hour. Jupiter is so far from earth that a signal sent to Pioneer at encounter will take 45 minutes to get there, even though it travels at the speed of light (186,000 miles per second).

Pioneer's onboard experiments, which have already provided space information enroute to Jupiter, are designed to yield useful data as far away as 20 astronomical units–about 2 billion miles.

Early next year when the Pioneer data has been examined and analyzed, we'll have some first-hand information for you on this giant of the solar system.

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**COVER:** A growing number of openminded scientists see ESP and other psychic phenomena as worthwhile areas of investigation. See p. 298 (Drawing: M. C. Escher, Escher Foundation, Haags Gemeente-museum—The Hague)


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# to the editor

## Science and superstition

Your correspondent, Clarence G. Zike, is quite correct when he observes that "As true of science in general, every major discovery in astronomy raises more questions than it answers" (SN: 10/6/73, p. p. 251).

He can put his mind to rest, however, about his imagined lack of a most logical explanation of the phenomena which seem to violate physical laws, e.g., "intelligent intervention."

It is just this thinking that is as old as the history of mankind that led to the separation of science and religion—remember Galileo?

How else can Zike explain the existence of superstition even in this enlightened age?

*John W. Orner*
*Wilmington, Mass.*

**In her letter** entitled "Not a valid hypothesis" (SN: 10/27/73, p. 259), Lois Ann Horowitz raises an important point. While it is not particularly difficult to suggest unorthodox explanations for various phenomena, it often requires unusual intelligence to see ways in which to test such ideas, thus converting them to "valid hypotheses." It is this uncommon vision that allows the scientific method to act as a challenge rather than as a shield.

*David Dunthorn*
*Oak Ridge, Tenn.*

## Moonshine

I am intrigued by your comment on the density of the moon's atmosphere in the correspondence section of the Oct. 6 SCIENCE NEWS. Based on the 5 trillion to one earth-moon ratio which you quote, I have computed the total weight of the moon's atmosphere to an altitude of 1 mile at under 40,000 pounds. Take away the total weight of volatile effluent from all U.S. and Soviet moon craft, dumped in moon orbit, and what is left? The answer probably falls between Heisenberg's principle and Murphy's law.

*John P. C. Allen*
*New City, N.Y.*

## Collar and Tye

SCIENCE NEWS is just great—I welcome its arrival every week and recommend it to my friends. Keep up the good work.

"It's All in the Name" seems to have tickled the fancy of a great many of your readers and has led to the submission of a number of new and amusing examples where the names really count. Here's another.

During World War II there were a couple of very bright scientists at the Royal Aircraft Establishment, Farnborough, England, whose frequent collaboration and jointly published reports led to quiet amusement in those days when there wasn't too much to smile about. One of them, Prof. A. R. Collar, became vice chancellor of the University of Bristol; the other, Mr. Walter Tye, became the chief executive of the British Air Registration Board. I think the names on their joint reports always appeared in that order.

*John J. Green, Ph.D.*
*Ottawa, Canada*

P.S.

Both men are, I believe, well known to the aeronautical fraternity in the U.S.A.

## Human aggression

Studying war will not provide answers to questions about human aggression nor will studying human aggression provide solutions to ending wars (SN: 10/20/73, p. 251).

Wars cannot be treated as manifestations of human aggression. They are politico-economic expedients instituted by handfuls of men (governments) for some very pragmatic reasons. Ordinary people who fight wars don't want to . . . . Their aggression is motivated by self survival on a battlefield.

In historical perspective, the questions we need answered are: How have we, the troops, allowed the leaders to subvert what evolution has taught us, namely the intelligent control of aggression.

*Lewis Schwartzman*
*Flushing, N.Y.*

## Cultural diversity?

The claim by the Soviet anthropologist J. V. Bromley of the Soviet attempt to maintain "a diversity of languages and life styles" among various ethnic groups (SN: 9/15/73, p. 170) is certainly negated by the treatment of Ukrainians and Jews. Indeed, in the latter case it amounts to a form of cultural genocide.

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# Atomic energy from fusion plus fission

## 'Thermonuclear fission' of boron may be a power source for the future

The world's future energy needs will be solved mainly by release and utilization of the binding energy of atomic nuclei or they are likely not to be solved at all. The energy can be released either by the fission of heavy elements (uranium, plutonium), which is already an operative possibility, or by the fusion of light ones. Fusion is still in the future, but the cycles on which most research is being done are deuterium fusing with deuterium or deuterium fusing with tritium.

Now a new fuel and a new cycle are proposed, which partake of the nature of both fusion and fission. It involves the fission of the common element boron and has been dubbed "thermonuclear fission." The proposal was presented last week at the meeting of the American Physical Society's Plasma Physics Division at Philadelphia by Thomas A. Weaver of the Lawrence Livermore Laboratory.

The new reaction is a fundamental departure from conventional concepts of fusion and fission. Generally the balance of energy within atomic nuclei is such that only fission of heavy nuclei and fusion of light ones yields energy. Fission of lightweight nuclei is generally difficult to achieve and costs energy. But there is an exception for nuclei that can divide themselves evenly into an integral number of helium nuclei (also called alpha particles).

The helium nucleus is a particularly tightly bound entity that appears as a kind of building block of heavier nuclei. When these helium building blocks are present in integral numbers with nothing left over, the fission of the larger nucleus can yield energy. It is this exception that Weaver and his collaborators suggest using.

The way to go about it is first to fuse nuclei of hydrogen and of boron-11, the most common form of boron. Lasers would be used to irradiate from all sides a small pellet containing a mixture of the two elements. The laser light would cause heating and an implosion in which the two elements would fuse. The fusion yields boron-12. The boron-12 would then fission, 99.9 percent of the time dividing evenly into three helium-4 nuclei. For the past year and a half physicists at LLL and the California Institute of Technology have been studying the characteristics of the reaction, using boron-11 samples and protons from an accelerator. Others in the work besides Weaver are Lowell L. Wood, who first proposed the use of this reaction, and G. B. Zimmerman, H. F. Lutz, I. D. Proctor and W. Bartolini at LLL and T. A. Tombrello and M. Dwarkanth at Caltech.

The proton fission of boron would be extremely clean of radioactive by-products, much cleaner than any other fission or fusion cycle now in use or proposed. Another advantage is that the energy is carried off by charged particles, making conversion to electric energy easier than for most other cycles, which tend to yield energetic neutrons.

The energy of the boron fission could be converted directly into electric currents by collecting the charged helium nuclei at electrodes or by magnetohydrodynamic (MHD) methods. The MHD method being considered would use a pulse of energy from the boron reaction to expand a preexisting magnetic field across an electrical conductor. The change in the field would cause a current to flow in the conductor. Energetic neutrons have to be trapped in a substance, which they heat. The heat is used to boil water to make electricity in a steam turbine.

There are other elements that are one proton shy of having an integral number of helium nuclei. They include nitrogen-15 (four heliums), lithium-7 (two heliums) and fluorine-19 (five heliums). But boron-11 was found to produce the highest net energy under reactor conditions.

It is likely to be many years before a boron reactor is operating. Weaver stresses the extreme technological difficulties involved in bringing the idea to fruition. One of the worst of them is the extremely high temperature necessary, 3 billion degrees, and the requirement of lasers 10 times as energetic (100,000 joules) as those now contemplated for fusion reactors using other cycles. Thus the boron cycle is likely to come into use later than the other proposed fusion cycles. But the cleanliness of the reaction and the abundance of its fuel (boron is plentiful in the oceans and in dry lake beds) may make it a desirable future alternative to them.

## Lasers measure moon distances to 6 inches

"How high the moon?" asks a romantic song. Whatever the answer may mean to lovers, the exact height of the moon is a datum of great importance to science. The exact distance to the moon can be used to study continental drift, polar wandering, phenomena inside the earth and the mass distribution in the interior of the moon.

Now work with laser beams reflected off devices on the moon has succeeded in measuring variations in the earth-moon distance to an accuracy of 6 inches—the most accurate measurement ever. Work in the next year or so is expected to narrow the figure to about 1 inch. The measurements are the work of the Lunar Ranging Experiment (LURE) team, a group of scientists headed by James Faller of the National Bureau of Standards' Boulder laboratories.

The men in the moon, specifically those of Apollo 11, 14 and 15, placed arrays of corner reflectors at various points on the moon's surface. (Corner reflectors are shaped like cubes cut in half along the diagonal; they send light back in the direction it came.) Pulses of laser light sent through a telescope from earth are reflected back, and their flight is precisely timed. Since the roughly 235,000-mile distance to the moon varies, the experiment must be done repeatedly for a long time to gain a statistically significant picture of the moon's motions.

The pulses take about one and a quarter seconds to get to the moon. When the light beam arrives, it has spread to a diameter of two miles. By the time it gets back to earth it has spread to 10 miles. Only a billion-billionth of the light sent out comes back to the detector on earth, yet it is enough, but just barely, to activate a photoelectric mechanism that stops the clock. □

## Off to Mercury with a cold glance

Mercury ho! Mariner 10 is on its way.

Venus ho, too. Launched at 12:45 a.m. (EST) on Nov. 3, Mariner should pass within 3,300 miles of Venus on Feb. 5. It will then become the first spacecraft to use a technique, proposed some 12 years ago, of letting the gravitational field of one planet bend its course around toward a second objective. That's Mercury, of course, where it will arrive less than two months later, on March 29. After that it will swing around the sun and come back for a second look at Mercury 176 days later, and possibly a third (SN: 10/6/72, p. 220).

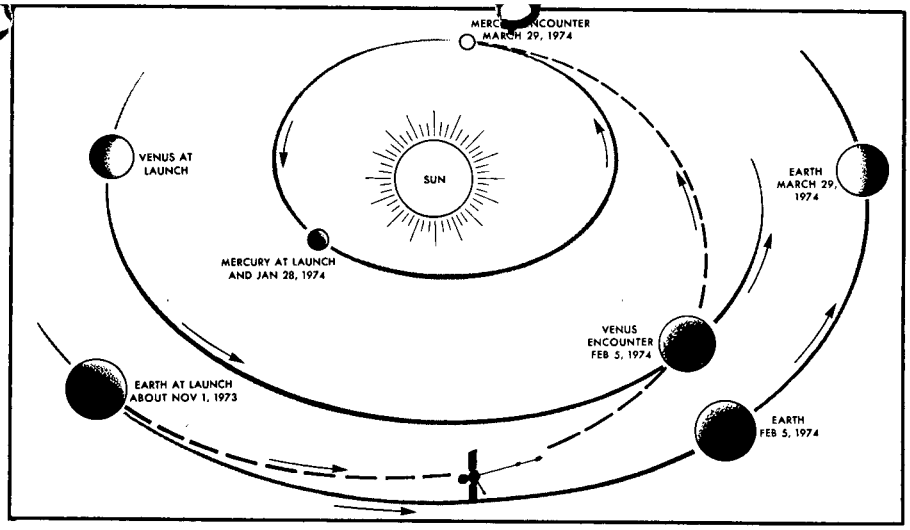
Mariner's most exciting data may come from a pair of television cameras, which should provide the first close look at the sun's nearest planetary companion, revealing surface features less than a mile across. But there's a problem.

After 53 minutes after launch, when flight controllers signaled the spacecraft to turn on the 12 heaters that are supposed to protect its delicate components from the cold of space, the two heaters for the cameras failed to respond. This posed a double threat: the absolute cold itself, and the difference in temperature between the front and rear ends of the telescopes that will magnify the cameras' view. If the difference gets too great, the barrels holding the telescope lenses could warp, distorting the TV images.

With the heaters working, the cameras' vidicon tubes should each be at 60 degrees F., the rear ends of the telescopes (protected by the spacecraft) at 47 degrees and the front ends at 40 degrees. Instead, by Nov. 6 the vidicon tubes had chilled to 14 degrees, the telescope rears to minus four degrees, and the front ends to minus 22 degrees. In early test pictures taken of the moon and earth, scientists running the mission at Jet Propulsion Laboratory at one point thought they saw some distortion, but later changed their minds.

NASA

*Looking at Mercury from 621 miles.*




NASA

*Thanks to Venus, Mariner 10 will be the first spacecraft to visit Mercury.*

Another problem appeared when an experiment designed to study a range of energy levels in the solar wind stuck at the high end of its voltage sweep. "It's getting a few cosmic ray-type particles," said an official, "but none of the solar wind." This, too, was believed to be a possible heater problem, since the instrument was "performing as it would with a cold start."

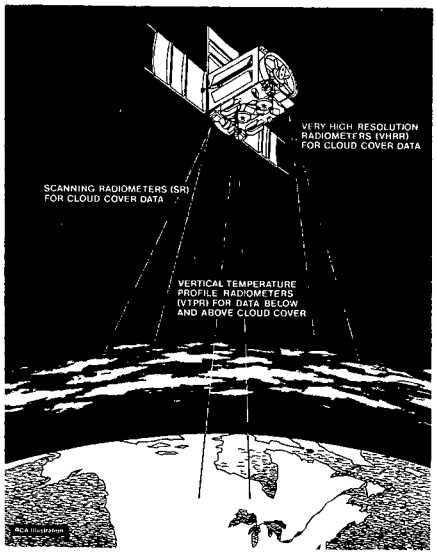
Officials planned to send "on-off-on" commands to the heaters in hopes that they will respond, after first trying the procedure on a backup spacecraft on the ground at the Kennedy Space Center in Florida. □

## Broadcasting the air's temperatures from space

Ten years ago the eighth of the Tiros weather satellites was launched into orbit, carrying an experimental device that allowed anyone to receive photos of the earth directly from the satellite. Users needed only relatively inexpensive equipment and no longer had to wait for the satellite's signals to be processed and delivered from a central computer complex.

As recently as a year ago, says Marvin Harper, a sensor engineer for RCA Corp., which has built most of the U.S. civilian weather satellites, it was assumed that this direct-readout capability would be needed only for photos. For more detailed data such as temperature profiles, users would presumably be willing to wait up to 12 hours for centralized processing and delivery. But since then, some 25 countries have shown an interest in just such a readout capability for other data.

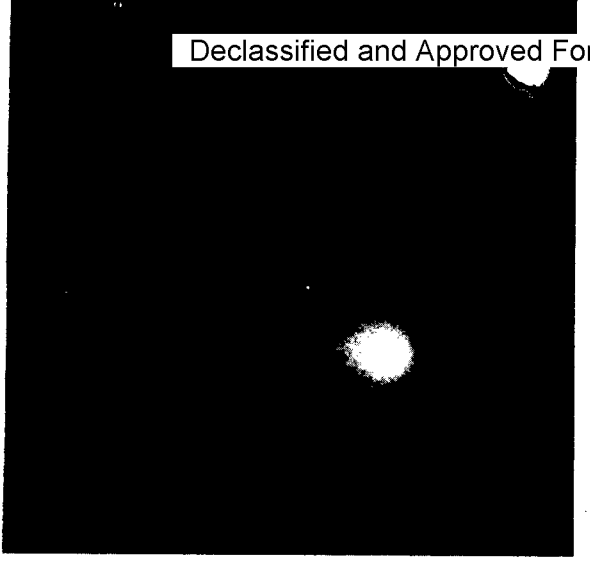
This week they got their wish. NOAA-3, the newest U.S. weather satellite, was launched Nov. 7 from California with a device to let users receive directly from the satellite temperature profiles measured at six altitudes ranging from the surface of the earth up to about 20 miles. Data can be received when the satellite is above a spot as far as 1,800 miles away from the ground station, so that, for example, India could watch for conditions indicating an approaching monsoon.




RCA

NOAA-3 *tells temperatures for anyone.*

Except for the direct readout equipment, NOAA-3 is virtually identical to NOAA-2, launched Oct. 15, 1972, and with another satellite that would have been NOAA-3 but failed to reach orbit in July of this year. The profile sensor has a resolution of about 30 miles; another temperature probe provides half-mile resolution, but it requires a receiving antenna that would be too expensive to interest most direct users. The satellite is expected to cover every point on the globe twice a day. □



## Comet Kohoutek

*A photograph of the comet Kohoutek in last week's issue, taken Sept. 29, failed to reproduce accurately when enlarged for printing. This more recent photo of the approaching comet was taken Oct. 26 by astronomers at the University of California's Lick Observatory, using the observatory's 20-inch astrograph. The comet should soon be visible to the naked eye above the southeastern horizon before morning twilight. It will not become an evening object until Dec. 28, after it passes around the sun. In early January it may be magnificent in the west-southwest after sunset.*

## Switching off allergies: A 'silencer' molecule?

An allergy is a superreaction of a supersensitive person to substances as diverse as pollen, dust, steamed clams or penicillin. Allergy victims announce their presence by wheezes, sneezes, tearing eyes or runny noses. Thirty-one million Americans suffer from allergies. They lose $285 million in work hours annually because of their problem.

The only treatment now available is time-consuming, costly and too often ineffective. It consists of weekly shots of the allergen (substance) to which a person is supposedly allergic. Why such shots desensitize some patients and not others is not clearly understood.

A more effective and economical treatment for allergies is needed, and one promising approach is being explored by David H. Katz, Toshiyuki Hamaoka and Baruj Benacerraf of Harvard Medical School. These three research immunologists report in the October PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES that they have managed to switch off, in mice, the class of antibodies that causes allergies. They hope they'll be able to take a similar tack in switching off allergies in people.

When a specific organic molecule—"Dnp"—is linked with a protein and then injected into an animal, it prompts lymphocytes in the animal to make the class of antibodies that causes allergies. But when Dnp is linked with a particular molecule that does not exist in nature—"D-GL"—and is then injected into an animal, the lymphocytes no longer make the antibodies. Why the Dnp-D-GL packet triggers this response is not yet known. But being able to switch the antibodies off may constitute a way of switching off allergies.

Just injecting a Dnp-D-GL packet won't turn off allergies, though, Katz says. The reason is that lymphocytes of different specificities are involved in each allergic response. Wiping out the lymphocytes that respond to Dnp won't wipe out the lymphocytes that respond to a particular allergen. So the allergen in question would have to substitute for Dnp in the Dnp-D-GL package. This way those lymphocytes that normally respond to the allergen would no longer respond because the allergen is hooked to the silencer D-GL. In other words, if you were allergic to pencillin, you would get injections of penicillin allergen linked to D-GL. Or if you were allergic to ragweed pollen, you would get ragweed allergen linked to D-GL. "We are in the process of making a molecule of a ragweed allergen linked with D-GL to test initially in mice," Katz says.

Because only specific lymphocytes would be turned off by this method, Katz is not unduly concerned that lymphocytes needed to fight infections would be wiped out. But there is this possibility. So for this and other reasons related to possibly harmful side effects, more research has to be done before lymphocyte silencing can be used to treat allergies. □

## A record year for tornadoes in the U.S.

After only five months of 1973 had passed, meteorologists were beginning to think that it might well become the Year of the Tornado (SN: 6/16/73, p. 387). Now they know it.

On Sept. 25, tornado No. 930 set a new record for the number of twisters in the United States in a single year, breaking a mark which had stood since 1967. Less than a week into November the number was up to 975. Besides the national record, 10 states —Connecticut, Illinois, Indiana, Kansas, Maryland, Michigan, Missouri, New Jersey, North Carolina and Ohio —have each been blasted with unprecedented numbers of tornadoes this year.

From 1916 through 1935, the first 20 years during which coordinated records were kept, there was an average of about 136 twisters reported per year. In the 20 years ending in 1972, however, the annual average was up to 659. Much of the difference is due to better reporting of storms, says Allen Pearson, director of the National Severe Storms Forecast Center in Kansas City. Nonetheless, he says, it does seem that for some reason the numbers of tornadoes have been growing in recent years. This is the third year in a row in which the total has exceeded 700 (it had only happened three previous times in the past), and the twelfth year in 14 with more than 600 tornadoes.

The death toll, fortunately, is low. There have been 75 fatalities so far in 1973, compared to a 20-year average of 114 and an all-time record of 794 in 1925 (689 of them due to a single titanic twister that blitzed Missouri, Illinois and Indiana).

A lot of the credit for the low death tolls, says Pearson, goes to improved warning systems. Perhaps the largest single system is Project Skywarn, operated by the National Oceanic and Atmospheric Administration and so far working in 30 states and the District of Columbia. A NOAA educational program urges any person actually spotting a tornado, either visually or on radar, to report it to the nearest National Weather Service office or law enforcement agency (who will relay it to the NWS). There the warning is checked and sent out, with an alert signal, over the NOAA Weather Wire service to radio and television stations.

Last month, for example, a tornado was reported heading for Salina, Kan. Besides the radio and TV warnings, a network of 16 sirens was used to sound an alert, and law enforcement officials patrolled the streets in the section where the twister was predicted to strike. When the tornado struck, it roared straight through a trailer camp on the edge of the city, but the camp's population of about 80 had gathered in a shelter beneath the camp clubhouse. The clubhouse itself exploded, and the 44 mobile homes were totally destroyed. ("I saw it myself," says Pearson. "Most of the debris was no more than knee high.") Death toll: Zero.

The tornado's rampage was far from over, however. It hopped along the ground from town to town—from Salina to New Cambria to Niles to Clay Center to Greenleaf—flattening hundreds of homes, businesses and other structures, yet only three fatalities resulted. □

## How go the grizzlies? An emotional debate

In his Oct. 31 syndicated column, Jack Anderson reported that "a secret Interior Department study" warns that grizzly bears in Yellowstone National Park are in danger of extinction because their food supply—garbage dumps—has been suddenly closed down. Shutting the dumps abruptly has driven "the panicky bears into campsites and off-park lands, where they have been shot."

How much truth there is in these comments depends on whom you ask. Grizzlies seem to arouse as much emotionalism as motherhood and apple pie.

The study Anderson apparently refers to was conducted over the past eight years by grizzly authorities John and Frank Craighead. John, in Missoula, Mont., is an Interior employee. His brother, in Moose, Wyo., is not, and therefore is in a better position to speak freely about the controversial grizzlies.

The rapid phaseout of dumps is over now, Frank Craighead told SCIENCE NEWS, but "the situation is really critical for the grizzlies. We feel that there are not more than a hundred left now." And because of the rapid shutting of the dumps, he says, "We know of 118 grizzlies killed in 1970, 1971 and 1972. . . . They [the Yellowstone staff] have the attitude, particularly in recent years, that they can do anything. It is a real dictatorship."

"No way!" counters Glen Cole, supervisory research biologist at Yellowstone. "We haven't shot a bear this year, and we haven't had an injury, and everything is working out beautifully on the program." The grizzlies have reverted back to feeding in the wild, Cole claims. "We have good data this year," he says. "There are 250 to 290 grizzlies in Yellowstone."

Deaths among the Yellowstone grizzlies were "drastically reduced" this year, and "as far as we can tell, their reproductive rate is increasing," asserts Charles Lovless, acting assistant director of the Bureau of Sports, Fisheries and Wildlife in Washington, D.C. The Bureau, part of Interior, is processing the Craigheads' study. Although the study is still preliminary, a copy of it is available to anyone who is interested. "The report is not published as a scientific publication," says Lovless. "It is a preliminary report that has been prepared, and we are not prone to muzzle our research people. If they have data that show certain kinds of conclusions in their view, then they have every opportunity and right to publish it. The thing they have to answer to is the opinion of their peers." □

## OTA finally funded; Daddario gets the call

The long-awaited Congressional Office of Technology Assessment (OTA) has finally been granted $2 million to get started, and ex-congressman Emilio Q. Daddario (D-Conn.), who introduced the original bill to establish the office, back in 1967, was last week appointed director.

OTA has been praised as a legislative alternative for the now defunct White House Office of Science and Technology (OST) and condemned as a "shadow cabinet" to further the political ambitions of Sen. Edward Kennedy. As the organization finally shapes up, it will be neither so powerful nor so partisan.

The permanent staff of OTA, headed by Daddario, will act as intermediaries between a board of Congressmen, headed by Kennedy, and an advisory council of "distinguished citizens," which in turn will appoint panels of experts to be responsible for investigations into specific technical areas. Actual assessment studies will be conducted by various contractors, including universities, think-tanks and private laboratories.

The Congressional Technology Assessment Board hardly looks like a "shadow cabinet." Members are evenly divided by party and political persuasion. They are Senate Democrats Kennedy, Hollings and Humphrey; Senate Republicans Case, Dominick and Schweiker; House Democrats Davis (Ga.), Teague and Udall; and House Republicans Mosher, Gubser and Harvey.

Congress originally conceived OTA as a kind of "watchdog" organization over technology, comparable to the legislative branch's Government Accounting Office that keeps track of Administration spending. But eradication of OST may give OTA new duties as an originator of science and technology policy. "Our activities will be the principal focus for science policy in the country," an aide to Kennedy told SCIENCE NEWS, "by stepping into the vacuum left by the demise of OST."

That's a tall order for an organization with the tiny funding rate of $3 million a year, and ambitions of studying the energy crisis, environmental problems and biomedical issues. One recent study of the nation's energy crisis, conducted by the National Petroleum Council, for example, cost some $10 million by itself. Specific OTA projects will not be announced until after an expected two-month start-up period.

## Soviet psychiatry: A peek inside

Soviet psychiatrists have failed to convince their Western counterparts that psychiatry in the U.S.S.R. is not being used as a political tool. Returning from Moscow, American Psychiatric Association President Alfred M. Freedman said last week: "My experience certainly has not quieted at all my concern. If anything, I would say it makes me feel it is even more important that we have a thorough-going follow-up discussion."

The meeting with the Soviets was the result of a cablegram from Freedman to officials of Soviet psychiatry, asking for a discussion of "charges that involuntary psychiatric confinement has been used unjustly and without regard to human rights, including suppression of political dissent" (SN: 10/13/73, p. 230). At the meeting Freedman got the impression that "dissent, criticism or opposition are considered to be bizarre behaviors and important manifestations of disease . . . deviance appears tolerable," he went on, "until it is involved with political dissent."

Although no patients were interviewed and only summaries of six cases were presented, Freedman sees the meeting as a good beginning. He has asked the Soviets to allow a more complete investigation that would include private examination of patients with neutral interpreters. The Soviets, however, took a dim view of this request. □

## Science and technology 'being wrongly blamed'

Science and technology are being wrongly blamed for the troubles of contemporary society, contend Massachusetts Institute of Technology President Jerome B. Wiesner and Chancellor Paul E. Gray in their annual report.

"General disenchantment with science and technology would be more appropriately directed toward our society's decision-making processes for their slowness in recognizing the need for appropriate new technologies, than to science and technology itself.

"If, as we maintain, many of our current difficulties are the result of not responding to error signals that were present . . . then the remedy is to come to grips with that problem rather than resenting our achievements in science and technology." □

# behavioral sciences

## Injectable birth control

The contraceptive controversy, centering around issues of safety and efficacy, is far from over. The more effective a pill, cream, device or method seems to be, the more dangerous it seems to be. This holds true for the first and only injectable contraceptive to go on the market. The drug, Depo Provera (medroxyprogesterone), approved by the Food and Drug Administration for limited use as a contraceptive, is already on the market as a treatment for cancer of the uterus.

This drug is more effective than other methods, primarily because it has to be injected only at three-month intervals. But, says the FDA, "While the drug is clearly effective in preventing pregnancy, it presents the risk of infertility when use is discontinued. In addition, the drug has other adverse effects associated with the oral contraceptives." Evaluating eight years of research, the FDA has found that most women who use the drug can become pregnant, but only several months after discontinuance. Other adverse effects include possible relationships to breast tumors and blood clotting.

## Money and mental illness

The causes of many types of mental illness remain a mystery, but M. Harvey Brenner of Johns Hopkins University suggests that money may be at the root of this particular evil. In *Mental Illness and the Economy* (Harvard University Press, Nov. 1973) Brenner documents the direct relationship between national economic instability (low employment rates, etc.) and mental illness. Economic and institutional data from 1841 to 1967 show that this relationship has remained constant. "It is clear," he says, "that instabilities in the national economy have been the single most important source of fluctuation in mental-hospital admissions or admission rates."

## More on marijuana

The latest of the myriad marijuana reports indicates that chronic cannabis use causes no harmful effects. An 18-month study, commissioned by HEW, was performed on the island of Jamaica by the Research Institute for the Study of Man in New York and the University of the West Indies in Kingston.

For the study, 30 confirmed marijuana users (some had used the drug for 37 years) were matched with 30 controls who had never used the drug or who had only slight experience with it many years ago. None of the 60 had used heroin, morphine, LSD, amphetamines, barbiturates or jimson weed. Extensive clinical and psychological tests found no significant differences between the groups.

## Parents, peers and pot

The role of peer pressure in adolescent drug use is well known. Most young users get turned on for the first time by their friends. But, says Denise Kandel of Columbia University, the adolescent most likely to be a regular user of marijuana is one whose parents and peers both use psychoactive drugs. Kandel studied 8,000 New York State high-school students. The proportion of them who had used marijuana 60 times or more jumped from 2 percent among those whose friends had never smoked dope to 48 percent among those whose friends were 60-time users. This figure went up to 67 percent among those whose friends and parents were drug users.

# environmental sciences

## Worldwide environmentalism still shaky

The problems of industrialization without destroying valuable natural resources in developing countries was the subject of an international conference in New York City last month. Sponsored by the World Federation of Engineering Organizations, the conference was attended by 95 scientists, engineers and administrators from 34 countries. The attitude of most, according to a report in CHEMICAL AND ENGINEERING NEWS, was that economic and industrial growth must come before ecology in developing nations.

"In developing countries one can feel less anguish over future generations owing to the already sufficiently anguishing situation of the present generations," said Mohamed A. Isli, secretary general of the Union of Algerian Engineers.

The situation appears particularly critical in India where sulfur dioxide levels reach 0.223 micrograms per cubic meter of air in Delhi and 0.71 in Calcutta. The permissible limit in the United States is 0.1 and in Russia, 0.05.

A recent study conducted by the Ford Foundation tends to confirm the conclusion that economic and social pressures are forcing developing countries "to exploit rapidly their natural wealth at the expense of future consequences." The study cites an example of aerial crop spraying killing large numbers of fish and cattle recently in Indonesia.

To help meet the challenge, a World Environment and Resources Council was recently formed, bringing together various national engineering and scientific associations as charter members.

## American peregrine falcon almost gone

Despite efforts to reestablish America's peregrine falcon population (SN: 9/8/73, p. 158), the species has almost disappeared from the United States, according to an announcement by the Fish and Wildlife Service of the Department of the Interior.

Once ranging from Georgia to Alaska, no peregrines in the wild are left east of the Rockies, and only 65 active nesting sites are known in western Mexico, the United States and southern Canada. A study of 14 of these sites, conducted by James H. Enderson of Colorado State University, found that only three eyases were successfully fledged this year.

The major cause of the decline, the announcement states, is eggshell thinning because of DDT. This long-standing explanation of the bird's decline received further confirmation during the present study when unhatched eggshells were found to contain high concentrations of the pesticide and its metabolites. Thin shells are easily broken by adult birds sitting on the nest. A 20 percent thinning of peregrine eggshells is now common.

## Do-it-yourself pollution monitoring

An Oregon State University botanist has developed a method for laymen to estimate accurately the average, long-term air pollution in their areas by observing lichens, the crinkly colonies of fungus and algae that grow on rocks and trees. The study, conducted by William C. Denison for the National Science Foundation, concluded that some lichens are so hardy while others are so sensitive to pollutants that a scale could be devised whereby the pollution in an area can be gauged by which native lichens have survived. (Denison's work is available under the title "A Guide to Air Quality Monitoring with Lichens," for $3 including postage, from Lichen Technology Inc., Box 369, Corvallis, Ore. 97330).

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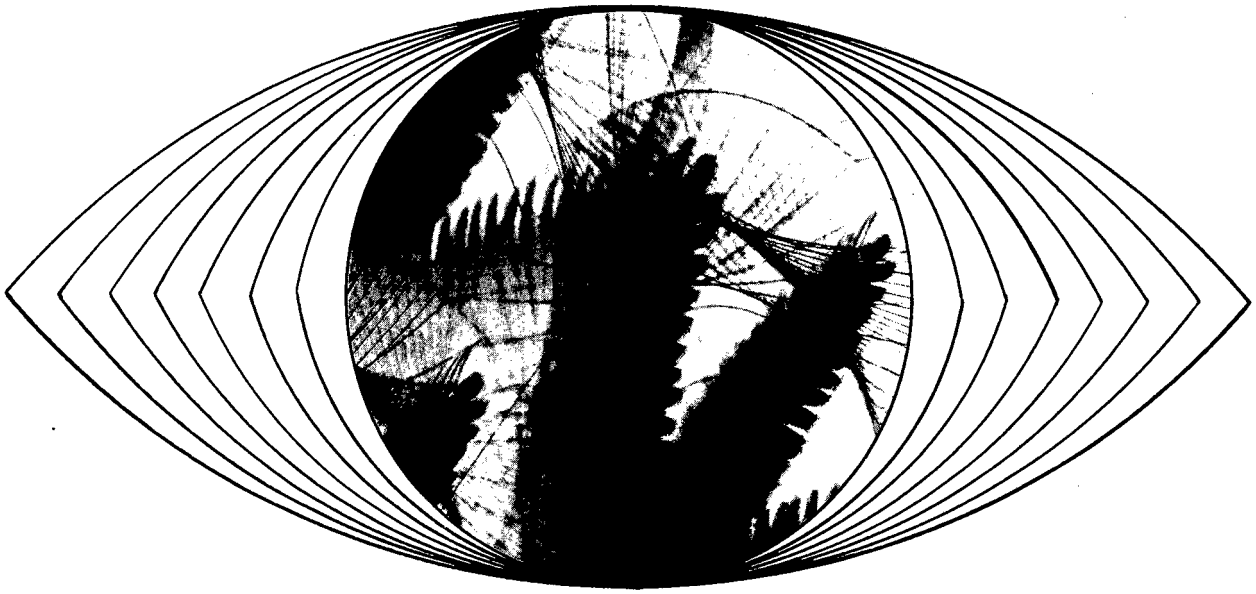

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# ESP and ASC

## With highly probable proof that extrasensory perception and similar anomalous phenomena exist, scientists now ask how

by Robert J. Trotter

"My lad, you are invincible," the Delphic oracle told young Alexander the Great. And Alexander, being a great believer in prophets, went on to fulfill the seeing lady's prediction. Even so, there were probably some skeptics who doubted the words of the famous oracle and bet on the Persians. Then, as today, the skeptics had to be shown before they would believe. And a basic paradigm of Western science has always been that "nothing is in the intellect which is not first in the senses." This strict empirical attitude is at the heart of an ongoing controversy.

There have always been and continue to be reports of strange happenings that cannot be explained away in physical or sensory terms. Among these illusive events are a group of interactions loosely termed parapsychological or psi phenomena. Extrasensory perception (ESP) is a psi phenomenon. It is an interaction between an organism and the external environment (including other organisms) that is not mediated by recognized sensory functions. Examples of ESP include telepathy (perception of another person's thoughts), clairvoyance (perceptions of objects or events not present to the senses) and precognition (the oracle's trick of seeing into the future).

The first serious attempts to study psi events under strictly scientific conditions began in 1882 in London at the Society for Psychical Research. Three years later, William James began investigating similar events in New York at the American Society of Psychical Research. These early studies attempted to authenticate individual cases of reported psi events. But this is not the way to go about studying psychic phenomena, in the view of Charles Honorton: "Spontaneous cases, however thoroughly authenticated, cannot provide adequate assessment of such potentially contaminating factors as chance coincidence, unconscious interference, sensory leakage, retroactive falsification or deliberate fraud." Honorton is a senior researcher in the division of parapsychology and psychophysics in the department of psychiatry at the Maimonides Medical Center in Brooklyn, N.Y. This research center, formerly known as the dream laboratory, has been investigating various forms of ESP since the early 1960's. Honorton is writing a book he describes as a detailed critical summary of all ESP research since 1940.

To avoid charges of fraud and to keep their work on solid scientific footing, serious parapsychologists introduced card-guessing and probability theory into their studies. J. B. Rhine and his associates at Duke University in Durham, N.C., popularized card-guessing as an experimental approach in 1934. Rhine devised a standard set of procedures around a simplified deck of cards. The cards, called Zenner cards, had five markings—either a circle, square, cross, star or wave. A sender in one room would pick cards from the deck at random while a receiver in another room attempted to guess the geometric shape on the card. The probability of success is one in five. But Rhine soon found that some subjects do better than others, and here is where the laws of probability come in.

The odds are one in six that a subject will guess 220 correct out of 1,000 cards. The odds go up to one in 2,000 if, after 5,000 guesses, the same subject has continued to guess correctly at a rate of ten percent above chance. The odds go up to one in 2,000,000 after 10,000 guesses if the same subject is still getting 11 correct (instead of 10) out of every 50. Some of Rhine's subjects began to get such astronomical results—results that are more than significant in any of the hard sciences.

"As a stimulant to experimental research on the probability of psi communication, the Rhine monograph had an influence which was totally unprecedented in the history of psychical research," says Honorton of Rhine's 1934 paper. Many researchers, using similar methodology, began to report significant results in favor of ESP. This success, however, stimulated a flurry of criticism in the psychological literature. Between 1934 and 1940, 60 critical papers appeared. They attacked card-guessing on every methodological level, and did turn up some cases of recording error and even fraud. Some even suggested that there might be a fundamental defect in probability theory.

The scientifically oriented investigators of psi reacted to the criticism by tightening up their procedures, and by 1940 the active methodological controversy was over.

"It is evident," says Honorton, "that while published criticism of the ESP work generally ceased by 1940, the decline of active controversy did not lead to widespread acceptance of the ESP hypothesis in the scientific community. Many psychologists appear to have adopted and stuck to the attitude of one researcher who defined ESP as "Error Some Place."

While such hard-line skepticism and controversy still represent difficult barriers for the parapsychologists, there seems to have been—especially within the past five years—a change of attitude on the part of some scientists. Some are beginning to view parapsychological research (no matter what its implications) as at least a valid endeav-

or. In 1969, for instance, the rather staid American Association for the Advancement of Science granted the Parapsychology Association an affiliate membership. At the meeting of the American Psychological Association this year, parapsychologists presented a number of papers and have applied for division membership within that organization. And the National Institute of Mental Health has even awarded grants for the study of psi phenomena. A similar change of attitude can be seen in England. Last year the NEW SCIENTIST polled its readership (mostly scientists and technologists) and found that only three percent of 1,500 respondents considered ESP to be an impossibility. But almost 70 percent said they felt psi phenomena were not being studied properly. They suggested that physicists, rather than psychologists, be involved (SN: 2/10/73, p. 88).

Honorton agrees. Speaking at the APA meeting, he said, "I think there will continue to be little progress in this area until there is more interdisciplinary involvement; a convergence of physical, biological and behavioral science on what appears to be a psychophysical problem." We will have to, he says, "adopt the strategies of science rather than the mentality of magicians."

Montague Ullman and Stanley Krippner (also at the Maimonides Center) have been attempting to employ such strategies for the past 13 years. They have been attempting to determine how ESP works, not that it works. A major portion of their research has been done on dreams.

Throughout history, dreams have been regarded as a prime source of ESP experiences. Four international surveys, including one taken by Rhine, have shown that up to 65 percent of all spontaneous ESP experiences reported have come through dreams. Ullman and Krippner decided to attempt to induce telepathic dreams under controlled conditions. "With the development of psychophysiological techniques for the monitoring of sleep," explains Krippner, "it became possible to move from a clinical level of observation to an experimental level."

In the dream studies, the person being studied sleeps at the dream lab. Electroencephalograph electrodes are fastened to the subject's scalp and movement sensors to the subject's eyelids. In this manner, brain wave changes that accompany dreaming are monitored, and rapid eye movement (REM) is monitored as another indication of dreaming. Experimenters rouse the subject every time there has been a dream. The subject describes the dream in detail and then goes back to sleep until another dream is registered. This procedure collects much more dream detail than if the experimenters waited until morning. In the morning, however, the subject is reinterviewed and additional material and subconscious associations are collected.

While the subject sleeps in a soundproof room behind four closed doors, an agent (at least 100 feet away) attempts to transmit a message or image to the dreamer via ESP. A colorful art print is most often the subject of the message. Prints with a highly emotional content (sexual, religious, etc.), the researchers have found, are most easily transmitted. The print for a particular night is chosen at random from a large collection after the subject is asleep. Only the agent or sender knows what the picture is.

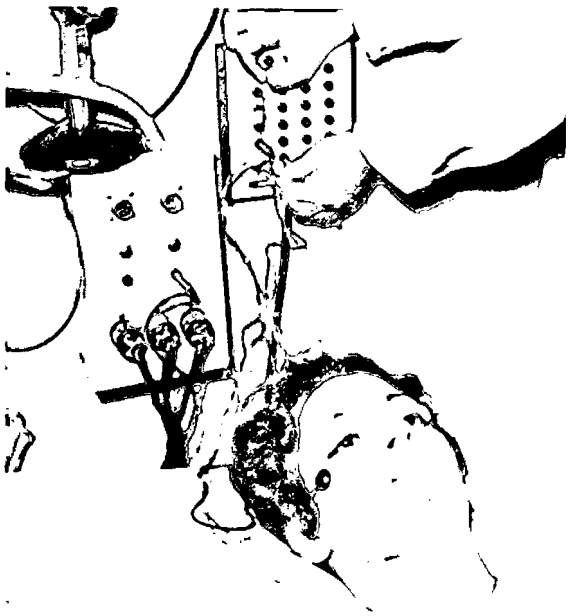
After the details of the dreams have been transcribed, they are sent, along with the copies of all the possible target pictures, to a group of independent judges. The judges compare the dream details and rank the pictures according to the amount of correspondence each seems to have to the dream. In more instances than would be predicted by chance, there was a significant relationship found between what was sent and what was received.

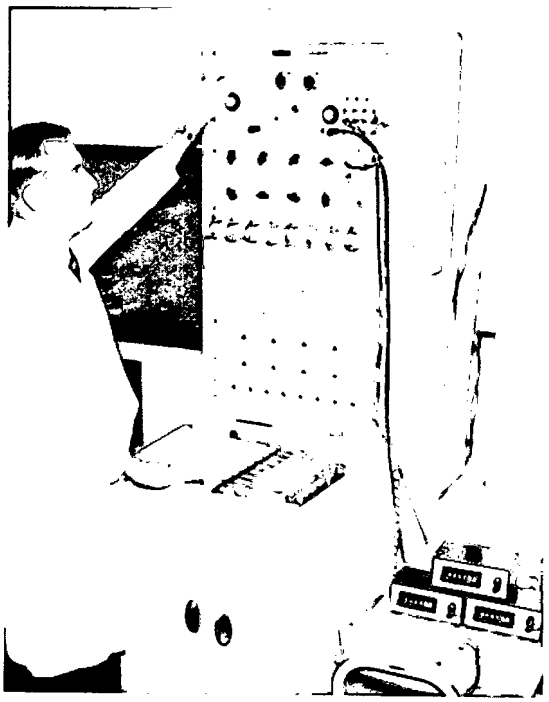
More than 100 subjects have taken part in these dream experiments (usually for eight or more nights). And 13 of the more elaborate studies (four of which were not statistically significant) have been published in parapsychological or psychological journals. Many of the other dream studies have been described by Ullman and Krippner in *Dream Telepathy* (Macmillan Publishing Co., Sept. 1973).

In one experiment, the target picture was a Japanese print, "Downpour at Shono." It showed a man walking in a driving rain. During the night the sending agent tried to get actively into the picture by taking a lot of showers and playing with a toy Japanese umbrella. Describing the night's dreams, the subject reported, "something about an Oriental man . . . a fountain, water spray that would shoot up. . . . Walking with someone on the street. . . . Raining."

According to Krippner and Ullman results such as this have gone beyond the point of proving ESP. They have shown that altered states of consciousness (ASC), such as dreaming, facilitate such events. Accordingly, they have done experiments on various other altered states of consciousness.

The "witch's cradle," or suspended





*Sweet dreams: Electrodes in place, a dream subject prepares for a novel night's sleep in a soundproof room while Krippner monitors electroencephalograph readings.*

Harold Friedman
from Dream Telepathy

they use to produce an ASC. The cradle is a metal platform, suspended from above, which is free to swing several inches off the ground. As the subject stands on the platform, even subtle body movements make the cradle rock erratically, but gently, in a random fashion. After several minutes on the cradle, in a dark and soundproof room, most subjects loose all sense of physical orientation and begin to have visual, and sometimes auditory hallucinations. The researchers have found that many of these hallucinations are veridical—they correspond to real-life experiments outside the suspension room. In a study reported by Honorton, subjects in this ASC obtained significant results in guessing which pictures were telepathically sent. Chance expectancy was 50 percent. The subjects who reported being in an ASC were correct 76 percent of the time.

A milder ASC can be produced by providing an isolated subject with a homogeneous visual field (ganzfeld) and continuous auditory stimulation. The subject in a ganzfeld experiment sits relaxed in an easy chair. Ping-Pong ball halves are taped over the subject's open eyes and a red light is turned on. This produces a blank red field of vision and keeps outside influences from interfering with any internally produced visual imagery. The auditory stimulation comes through earphones and is usually a tape of something calming, such as the sound of the ocean. This keeps auditory sensory inputs at a constant level. The subject is left alone and instructed to think out loud and report any feelings or visual images. The reports are taped and recorded, usually for 30 minutes. Meanwhile, a sender outside the room views stereoscopic pictures (because it is believed that the more real the message is for the sender, the more real it will be for the receiver) and attempts to transmit them to the subject. In this type of experiment, Honorton reports, "the target programs were correctly identified in 43 percent of the cases, significantly above the expected chance level of 25 percent."

Where will all of this rather strange and eerie research lead? No one is now sure. It may be the beginning of the development of some exciting possibilities for the human race. Or it may be, as Freud once suggested, that ESP is a fading phenomenon, something that belonged to our ancestors—not our descendants. "Telepathy," he said, "could be the original archaic means by which individuals understood each other and which was pushed into the background in the course of phylogenic development by a better method of communication, i.e., that of signs perceived by the sensory organs." □

## Excursion into ESP

Sitting alone with Ping-Pong ball halves over my eyes, a red light shining in my face and earphones piping the sounds of the sea into my head, I must have looked as foolish as I felt. But I had asked for it. This was the ganzfeld setup in the parapsychology lab at Maimonides. My task was to think out loud for 30 minutes while someone on the outside listened but did not answer.

After about a five minute delay, while I tried to relax and think of something to say, I decided to tell a few sea stories. These led to other associations and, eventually, a rather disconnected stream-of-consciousness monologue that went something like this: "Now I see something—a white circle—a lot of boxes and strange lines and shapes—black, white, deep red. The circles are turning into things. I see faces, clocks. I have a strange floating sensation. I am tilted to the left. My sense of balance is gone, I feel disoriented. . . . Now I see something else—green. Everything else has been red, black or white. A bright green triangle—a Christmas tree. It's squat and on its side. It's only in my left eye. . . ." This kind of talk went on until someone said, "Time's up. You've been talking more than a half hour."

The aim of the experiment is to induce a slightly altered state of consciousness and then attempt to use ESP to transmit an image. While I was in the room, an experimental package was randomly selected. The package contained four View Master slides and instructions for a sender to look at and attempt to send the contents of one slide to me during a specified five-minute period.

When I came out of the room, my comments were read back and I was told to look at all four slides. (The sender had seen only one of them.) I saw 3-D pictures of Yellowstone Park, Superman, a collection of geological specimens and Ford's theater. There seemed to be only a few pictures that corresponded to my images: a boat on a lake could have been related to one of my sea stories, the cartoon drawings of Superman were similar to the strange circle-like faces I had seen. But nothing really struck me until I looked at the slide of the rock collection. One particular rock was bright green and triangular, exactly like what I had called a Christmas tree. The vivid color and shape were so striking that, without hesitation, I ranked the rocks first as the most likely target.

The sender or agent was then called back into the room. He was the only person who knew what had been sent. That's right, it was the rock slide. The time of sending corresponded with the time I saw the image of the Christmas tree.

Did I really receive a telepathic message? I think I did, but I wouldn't try to talk anyone else into believing me. A single incident like this is only enough to convince the person involved. The parapsychologists know that thousands of reliable, controlled experiments are necessary before such findings become significant. And serious scientists are trying to do just this, not only at Maimonides, but at more than 30 universities and numerous research centers across the country.

My thanks to Pat Barker, Sharon Harper and David Torres—the young man who sent me a Christmas tree.

* * * *

With visions of ESP still fresh in my head, I saw something even harder to believe. At the invitation of the Isis Center in Silver Spring, Md., I interviewed Uri Geller—the Israeli psychic whose strange powers are being investigated by physicists at the Stanford Research Institute.

Geller is best known for his ability to bend or break metal objects without applying any visible physical force. During the interview, I held a heavy key between my thumb and forefinger. The key began to bend—too slightly to be perceptible—after Geller rubbed it lightly with one finger. The key was then placed on the desk and it continued to bend slowly for several minutes until it reached about a 20-degree angle. There was no obvious way the key I supplied could have been switched. Geller had no chance (by slight of hand or other trickery) to bend the key by force. And he didn't have a laser up his sleeve, as some have suggested.

Geller claims to have other powers that I didn't witness. He says, for instance, that he can sometimes dematerialize and materialize objects. He did, however, reproduce exactly a drawing that I did while his back was turned and his eyes were covered. It took 30 seconds.

When I relate this tale, most people think that I have been duped. But seeing is believing. Even the investigators at SRI have found no evidence of fraud and, though they draw no conclusions, they feel that further investigation is warranted.

*—Robert J. Trotter*

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**AGRICULTURE IN NEW JERSEY:** A Three-Hundred-Year History—Hubert G. Schmidt—Rutgers U Pr, 1973, 335 p., maps, $15. Definitive historical study, from frontier-period status as one of the Bread Colonies to Garden State and the impact of modern technology on farm practices and operations.

**THE AMATEUR'S GUIDE TO CAVES AND CAVING**—David R. McClurg—Stackpole, 1973, 191 p., photographs, drawings by LaRhee Parker, $5.95; paper, $2.95. Endorsed by the National Speleological Society, manual explains the scientific purpose, conservation and safety rules, techniques and equipment for underground exploration.

**THE AMAZING STORY OF HEALTH CARE IN NEW CHINA**—K. K. Jain—Rodale Pr, 1973, 184 p., photographs, $6.95. Canadian neurosurgeon's impressions of Chinese medical care, with its strong political overtone, stress on prevention, acupuncture, immunization programs, aided by a system of "barefoot doctors" and Red Guard doctors with minimum medical training.

**CRC HANDBOOK OF CHEMISTRY AND PHYSICS:** A Ready-Reference Book of Chemical and Physical Data—Robert C. Weast, Ed.—CRC Pr, 1973, 54th ed., 2,431 p., tables, $25.95. Revised, updated or expanded in sections ranging from mathematical constants, cryogenic properties of gases, photometric units and standards, to limits of human exposure to air contaminants, and strengths of chemical bonds.

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**THE CONSCIOUS BRAIN**—Steven Rose—Knopf, 1973, 354 p., illus., $10. Neurobiologist discusses in layman's terms how neurobiologists view the development of the brain sciences, the brain as a system, the evolution of brains and consciousness, specificity vs. plasticity, memory, emotion, sleep, madness.

**CRO-MAGNON MAN**—Tom Prideaux and the Eds. of Time-Life Books—Time-Life Bks (Little), 1973, 160 p., color plates, photographs, drawings, tables, $7.95. Describes arrival and development, 40,000 to 10,000 years ago, of hunting cavemen with the mental capacity and physical equipment to talk like modern man, as seen in testimony of Stone Age technology, sculpture and paintings.

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**GALAXIES OF LIFE:** The Human Aura in Acupuncture and Kirlian Photography—Stanley Krippner and Daniel Rubin, Eds.—Interface Bk (Gordon), 1973, 182 p., color plates, photographs, diagrams, $12.50. See story SN 9/29/73, p. 202-204.

**GUITAR REPAIR:** A Manual of Repair for Guitars and Fretted Instruments—Irving Sloane—Dutton, 1973, 95 p., photographs by author, $8.95. Photographs and text show clearly the necessary procedures of fine craftsmanship in restoring acoustic (hollow body) guitars—from warped necks and cracks to fractures and seam separations.

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**LIFE BEYOND EARTH & THE MIND OF MAN**—Richard Berendzen, Ed.—NASA (GPO), 1973, 106 p., illus., paper, $1.25. Abridged transcript of scientists' discussion exploring the implications of the possible existence of extraterrestrial life.

**THE TRAGEDY OF THE MOON**—Isaac Asimov—Doubleday, 1973. 220 p., $6.95. Collection of science essays about such varied topics as the moon, the speed of light, carbon, microorganisms, the thyroid gland, society, and science fiction writing.

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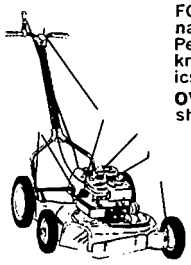

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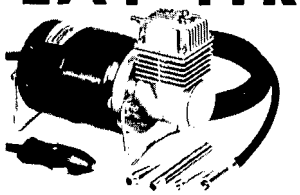

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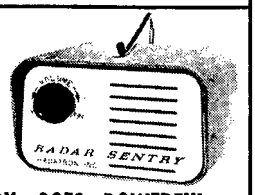


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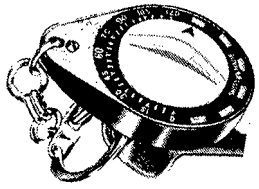

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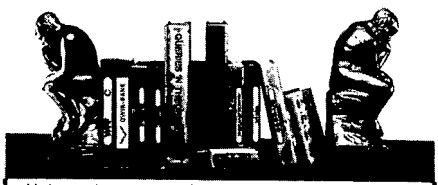

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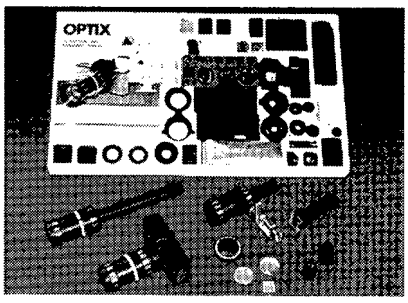


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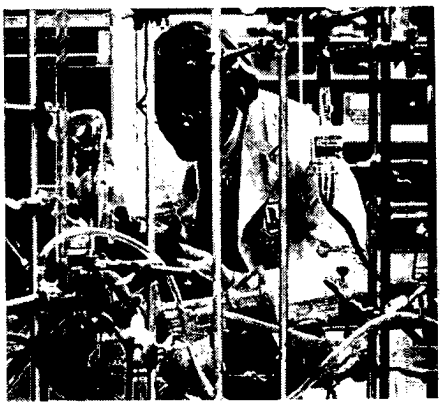

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